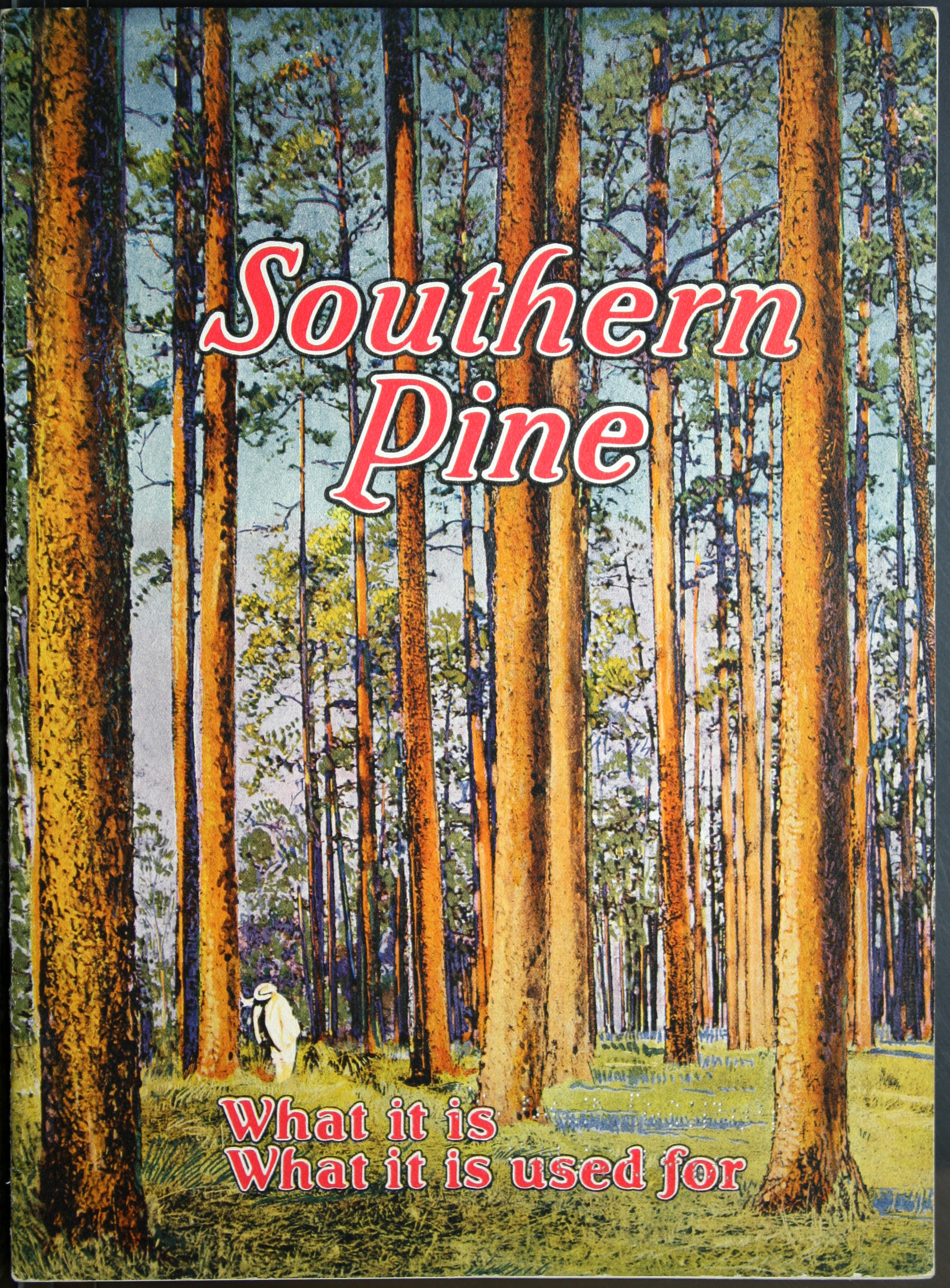
Southern Pine



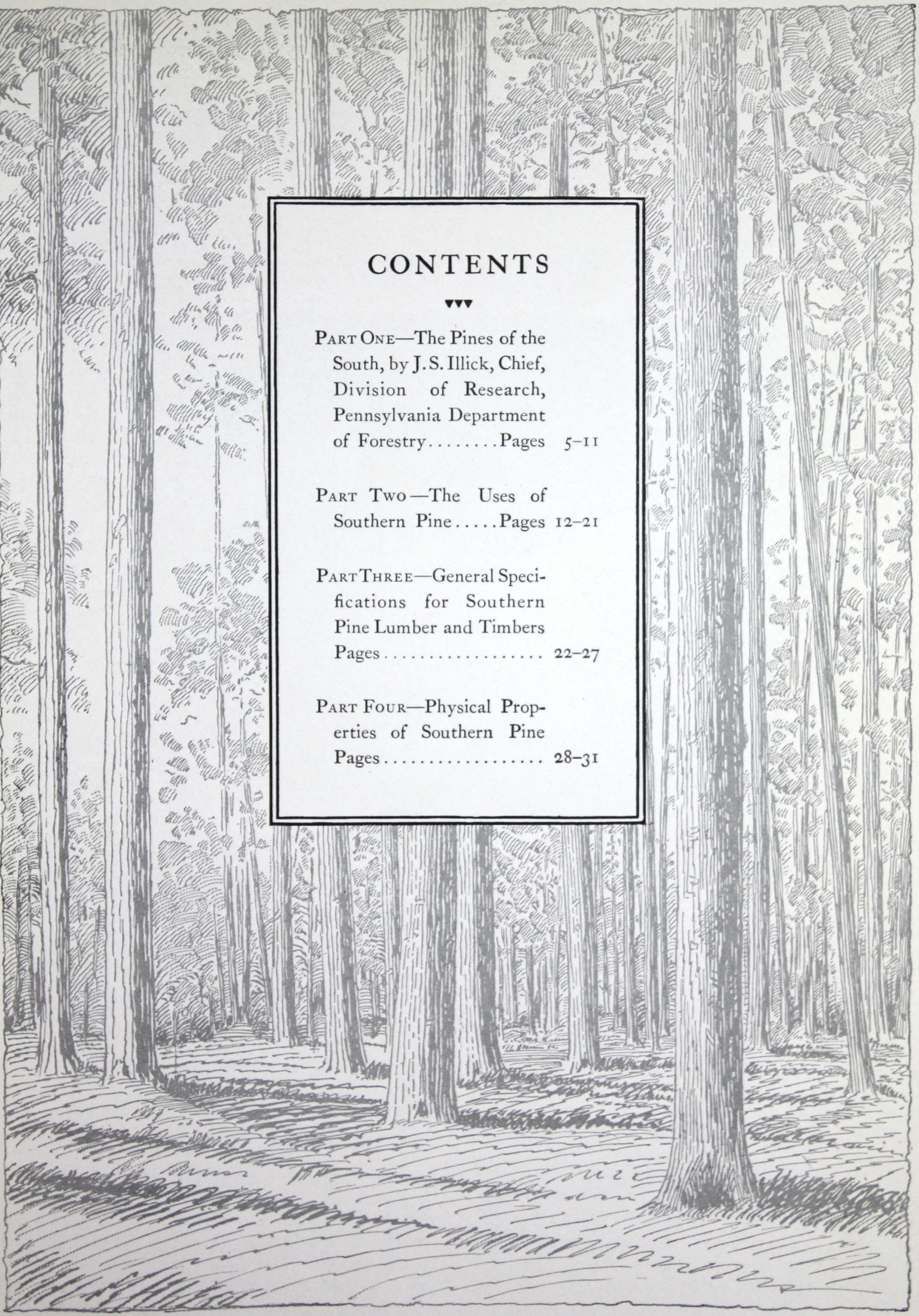
What it is
What it is used for

Southern Pine

What it is
What it is used for

Technical *and* General
Information *for* Architects
Engineers *and* Builders

Published by
Southern Pine Association
New Orleans, Louisiana



CONTENTS

SOUTHERN PINE

PART ONE

The Pines *of the* South

By J. S. ILLICK

Reprinted from American Forestry Magazine

THE South is the home of the Yellow Pines. They produce enormous quantities of the most useful wood that grows in America. More than one-third of all the lumber cut annually in the United States is produced by the Yellow or Hard Pines of the South. Southern yellow pine is often called the wood of a thousand uses. It may not have exactly a thousand uses, but it is so intimately associated with our daily life that it would be difficult for us to get along without it. We use not only the lumber of the Southern pines, but also large quantities of other products derived from them, such as tar, resin, turpentine and oil. The Southern pines comprise seven different kinds of trees. Some of them are well-known, occur over a wide range, and produce large quantities of valuable lumber, while others are little known, occur over only a restricted territory and produce only small quantities of very ordinary to inferior wood. The wood of the seven Southern pines grades into each other so freely that only three commercial kinds of Southern yellow pine lumber are generally recognized, viz.: 1, Longleaf Pine; 2, Shortleaf Pine; 3, Loblolly Pine. These three kinds of Southern yellow pine are the standard kinds now recognized in the general lumber trade. They are, however, not the only names used, for such other names as Georgia Pine, Yellow Pine, Southern Pine and North Carolina Pine are also common in the lumber trade. The characteristics by which the three standard kinds of Southern yellow pine wood may be recognized are not difficult to apply. They are given in the following outline: Longleaf Pine—1. Growth rings mostly narrow; uniform in width and outline; from 8 to 12 or more rings per inch. 2. Wood extremely heavy, hard, and very resinous; uniform reddish yellow to reddish brown. 3. Sapwood, thin. Shortleaf Pine—1. Growth rings mostly of medium width; usually from 6 to 8 per inch. 2. Wood medium in

(Republished from American Forestry Magazine)

A SPLENDID STAND OF LONGLEAF SOUTHERN PINE

The straightness and stateliness of the stems of Longleaf Pine are among its distinctive features. Stands such as this cover extensive areas and are made up of as fine tree specimens as one can find anywhere in the country.

SOUTHERN PINE

(*Republished from American Forestry Magazine*)

BARK OF THE LONGLEAF SOUTHERN PINE

The stem of the Longleaf Pine is straight, tapering but slightly, and it is usually free from limbs for more than one-half way to its top. The bark is thin and orange brown, separating on the surface into large, papery scales which lie flat against the trunk.

hardness and weight and moderately resinous; whitish brown to reddish brown. 3. Sapwood variable, but usually rather thick. Loblolly Pine—1. Growth rings very variable but usually extremely broad; from 4 to 6 rings per inch. 2. Wood variable from hard, compact and strong to light, coarse and brashy; yellowish to reddish or orange brown. 3. Sapwood very thick. While the wood produced by the Southern pines is grouped into only three standard kinds, it is actually produced by seven different kinds of trees. The common and scientific names of these seven trees are:

COMMON NAME	SCIENTIFIC NAME
1. Longleaf Pine	Pinus palustris.
2. Shortleaf Pine	Pinus echinata
3. Loblolly Pine	Pinus taeda.
4. Cuban Pine	Pinus heterophylla
5. Pond Pine	Pinus serotina.
6. Spruce Pine	Pinus glabra.
7. Sand Pine	Pinus clausa.

These seven trees vary widely in their economic importance. The first three produce large quantities of wood and other forest products of high commercial value, while the last three are trees of little economic importance on account of their restricted range and small size. All of the Southern pines belong to the Yellow Pine group. They are called Yellow Pine because of the yellowish color of their wood and bark. They are also called hard pines because their wood is very hard in comparison with the wood of such trees as white pine and sugar pine, both of which belong to the soft pine group. The wood of the Southern yellow pine is famed, not only for its hardness, but also for its strength and durability. In fact, the wood has such good qualities that it is put to a wide range of uses in every part of the civilized world. The pine forests of the South have been exploited for naval stores and other forest products from the time of the first settlers, but there was no extensive development of the lumber industry until the early seventies of the last century. It was then that the yellow pines of the South were first placed upon the market on a large scale. The wood was then exceedingly low in price. This created a strong demand for it and as a natural consequence, by the early nineties Southern yellow pine was leading the country in the cut of soft wood lumber.

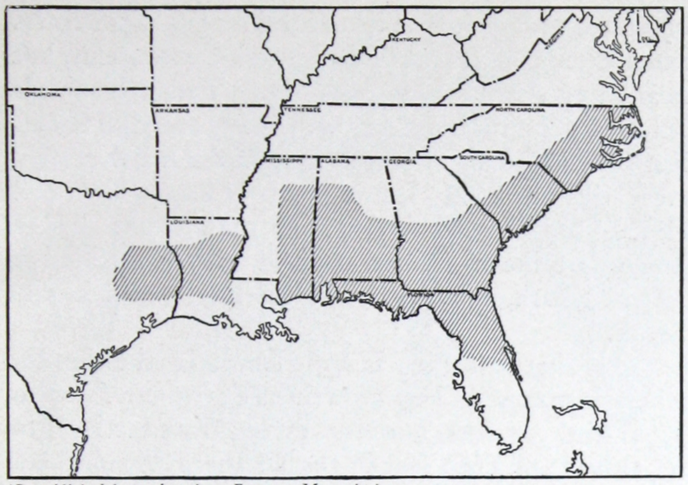
In 1909 the production of Southern yellow pine reached its peak. It then produced nearly one-half of the entire country's cut of soft woods. It is still the most important single factor in the lumber products of the United States. It furnishes about 35 per cent of the total lumber cut of the country.****

(*Republished from American Forestry Magazine*)

SHOWING DISTINCTIVE CHARACTERISTICS OF CONE AND LEAF

Left—(Shortleaf). The needles usually occur in twos and sometimes threes, rarely fours, and they run from 2 to 4 inches long while the cones are oval, about 2 inches long. Right—(Longleaf). These needles always occur in threes, and are 9 to 15 inches long, while the cones measure from 6 to 9 inches long.

SOUTHERN PINE



(*Republished from American Forestry Magazine*)

MAP SHOWING THE COMMERCIAL RANGE OF LONGLEAF PINE

It occurs from Norfolk, Virginia, to the neighborhood of Tampa, Florida, and west along the coast to the Trinity River in eastern Texas.

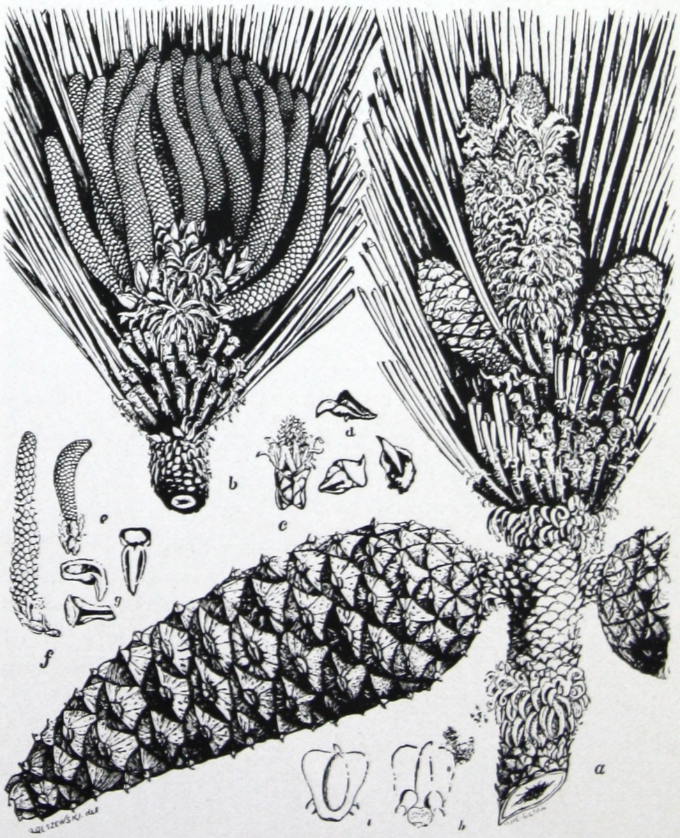
Each of the seven pines of the South has a number of striking distinguishing characteristics, which are present at all seasons of the year. One can find very evident differences in their leaves, cones, bark and the soil upon which they prefer to grow.****

The following simple table gives the principal characteristics of each species.

HOW TO TELL THE PINES OF THE SOUTH

NAME	LEAVES	CONES	BARK
LONGLEAF PINE	Occur in 3's, 9-15 inches long.	Occur near end of season's growth, 6-9 inches long.	Thin, bright reddish-brown, rarely scaly.
SHORT-LEAF PINE	Usually occur in 2's, sometimes in 3's and occasionally 4's, 2-4 inches long.	Oval, about 2 inches long, open at maturity.	Broken in oblong plates, light reddish-brown, somewhat scaly.
LOBLOLLY PINE	Occur in 3's, 3-7 inches long.	Oblong, 3-6 inches long, open soon after maturity.	Bright reddish-brown, broken into oblong plates.
CUBAN PINE	Occur in 3's, 8-12 inches long.	Oval to conical 3-6 inches long.	Dark reddish-brown, scaly and shallowly furrowed.
POND PINE	Occur in 3's, 6-8 inches long.	Oval, pointed, 2-4 inches long, rarely open, persist long.	Dark brown, broken into square or roundish plates.
SPRUCE PINE	Occur in 2's, less than 2 inches long.	About 2 inches long; cone-scale prickles short or wanting.	Light, reddish-brown, scaly and shallowly fissured.
SAND PINE	Occur in 2's, 3 inches or less in length.	About 3 inches long, armed with persistent spines.	Bright, reddish-brown, scaly, deeply furrowed.

The Longleaf Pine is one of the most valuable evergreen trees of the United States. What the White Pine was to the forests of the Northeast and the Lake States, the Longleaf Pine was, and in restricted areas still is, to the forests of the Coastal Plains region of the South. It occurs from Norfolk, Virginia, to the neighborhood of Tampa, Florida, and west along the coast to the Trinity River in Eastern Texas. Seldom does it extend inland more than 150 miles, and in some regions its range is less than 50 miles in width. Few trees have a longer list of common names than the Longleaf Pine has. It has no less than twenty-eight and some claim that it has thirty-three common names. Of all the common names, Longleaf Pine is the most appropriate, for its leaves, which range in length from 9 to 15 inches and occasionally reach 18 inches, are truly distinctive. Other common names are Pitch Pine, Turpentine Pine and Fat Pine. These three names refer to its resinous wood. It is also called Heart Pine because of the large proportion of heartwood produced, and the hardness of its wood gave it



(*Republished from American Forestry Magazine*)

FLOWERS, CONE AND NEEDLES OF THE LONGLEAF PINE

- **a.** Branch with mature cones and female flowers at top, just below which are young cones of one or two season's growth.
- **b.** Cluster of male or pollen-bearing flowers.
- **c.** Detached female flower.
- **d.** Detached young seed-bearing cone scales.
- **e-f.** Detached male flowers.
- **g.** Detached pollen sacks (anthers).
- **h-i.** Detached very young female flowers showing two ovules at the base, which later develop into seeds.

(*Republished from American Forestry Magazine*)

A YOUNG SHORTLEAF STAND

This is an important timber tree, attaining sufficient size for general forestry purposes, producing excellent wood, a good resin yield and it is markedly adaptable to climatic and soil conditions of the South Atlantic States.

the name of Hard Pine. Many of its common names are long, and often have the names of states as a prefix. Among these combination names are Long-leaved Yellow Pine, North Carolina Pitch Pine, Florida Yellow Pine, and Georgia Pitch Pine. Small plume-like branchlets covered densely with leaves and from 2 to 3 feet long, are sold for decorative purposes in northern markets at Christmas time under the name of "Florida Palm" and "Louisiana Palm." The straightness and stateliness of the stems of Longleaf Pine are among its distinctive features. Pure stands often cover extensive areas and are made up of as fine tree specimens as one can find anywhere in the country. The attractive appearance of many trees is, however, marred by the scars which they bear from resin tapping operations. The height of its stems rarely is more than 120 feet, and a diameter of 2½ feet is seldom exceeded. Probably the average tree cut in lumbering operations does not exceed 80 feet in height and 2 feet in diameter breast-high.****

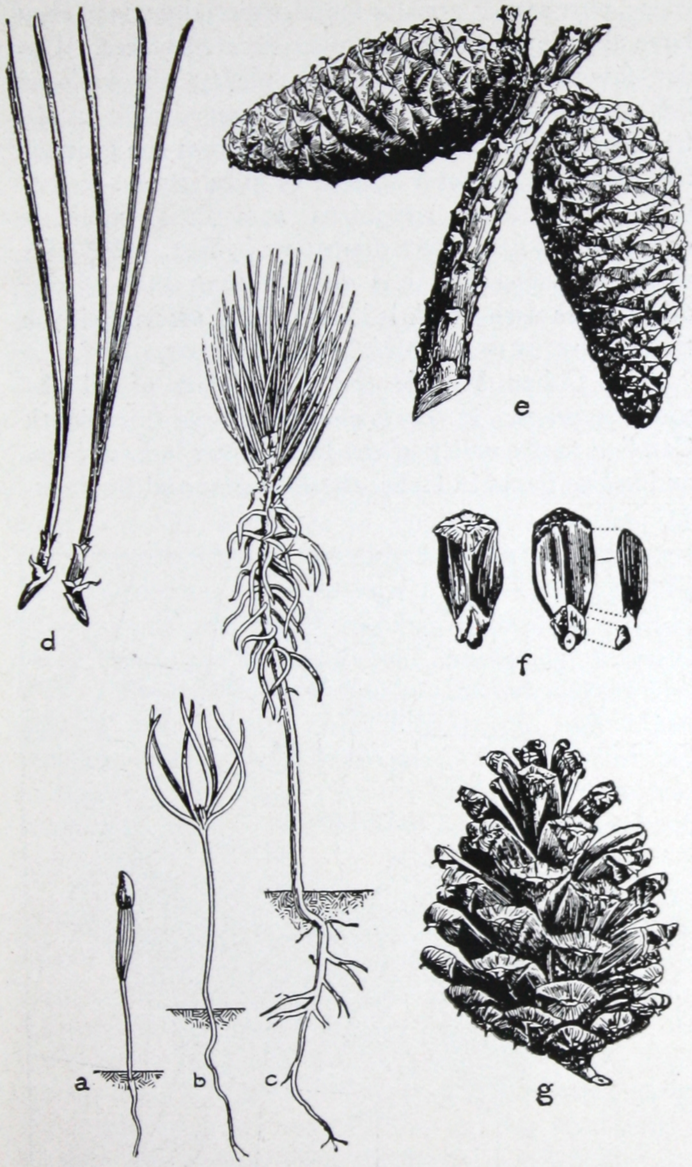
For more than two centuries Shortleaf Pine has held a prominent commercial place in the American lumber industry. It is found over an area covering more than 440,000 square miles and is of commercial importance on at least two-thirds of its natural range. Its natural range extends as far north as Western Connecticut, but near Mont Alto in Franklin County, Pennsylvania, is believed to be the most northern heavy stand of Shortleaf Pine in America. In this stand are many stately trees with trunks 2½ feet in diameter breast-high, and clear of branches for 60 feet from the ground. These knights of the forest are covered with a distinctive armored bark, fully as typical as any grown in the South.

The Shortleaf Pine is commonest in the South, where it makes its best growth at elevation of 400 to 1,500 feet. It does, however, extend from sea level to an altitude of 3,000 feet in the Southern Appalachian Mountains. The Shortleaf Pine has many common names. Some of them are appropriate while others are misleading and often embarrassing to one attempting to identify it. None of its fifteen common names will ever replace the name "Shortleaf Pine," for its leaves are truly short in comparison with the Longleaf Pine

(*Republished from American Forestry Magazine*)

BARK OF THE SHORTLEAF PINE

The light reddish-brown bark is rather thick and is broken into oblong plates which are covered with thin, cinnamon-red scales that peel off easily.



(*Republished from American Forestry Magazine*)

SHORTLEAF PINE LEAVES, SEED, CONE AND SEEDLING

a. Young seedling.
b. Same seedling after one month's growth.
c. Same seedling at end of first season showing early bundles of true leaves.
d. Two-leaf and three-leaf clusters.
e. Branch with mature closed cones or burrs.
f. Cone scale and seed with wing detached.
g. Mature cone opened.

and the other pines with which it is associated. Its distinctive leaves are slender, from 2 to 4 inches long and usually occur in twos, but occasionally three appear in a cluster and sometimes four may be together in a cluster.

The cones of the Shortleaf Pine are rather distinctive. They are brown in color, attached to the branches by a very short stalk, from 1½ to 2½ inches long and nearly as wide as long when open. Each cone-scale has an enlarged apex which is armed with a weak prickle. The cones open in early autumn to discharge the small triangular seeds, which are produced in large numbers and scattered widely about the trees. ****

The Shortleaf Pine has a long tap root. This enables the tree to obtain water from a considerable depth below the surface. Even in cases of heavy drought the trees do not suffer very much.

The Shortleaf Pine is a companionable tree. One may find small areas occupied by it exclusively, but in the major part of its range it is associated either with hardwoods or with other evergreen trees. Pitch Pine and Scrub Pine are common companions, and Loblolly Pine is frequently associated with it upon heavier and rather moist soil. As one approaches the Coastal Plains and other low lying regions of the South the Longleaf Pine is frequently associated with it, and at higher elevations, White Pine and Table Mountain Pine stand by its side. Many kinds of hardwoods such as oak, hickory, sassafras, ash, and cherry are also frequently associated with it. ****

(*Republished from American Forestry Magazine*)

VETERAN LOBLOLLY PINE TRUNK

(*Republished from American Forestry Magazine*)

EVEN-AGED MATURE SHORTLEAF PINE
The Shortleaf Pine is a companionable tree and while one may often find small areas occupied by it exclusively, in the major part of its range it is associated with hardwoods or other evergreen trees.

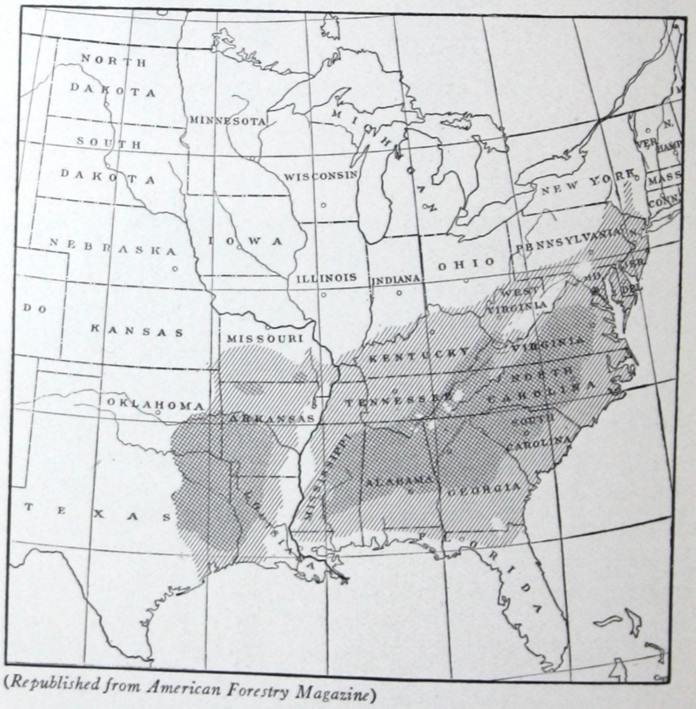
The Loblolly Pine has twenty-two common names. Some of them are quite appropriate, while others are misleading and meaningless. "Old Field Pine" is an appropriate name, for this tree is quite common in old, abandoned fields. Few, if any, trees show such persistency in encroaching upon and occupying abandoned fields and open places. This tree did an heroic piece of work after the Civil War in restoring a forest growth upon thousands of acres of abandoned farmland in the South.

Commercially it is classed with the other Southern Pines and sold as Yellow Pine, Southern Pine, North Carolina Pine, or Georgia Pine. Its scientific name is Pinus taeda. The second part of its scientific name is inappropriate, for the word taeda means "torch," and authentic records tell us that the resinous heartwoods and knots of this tree were not used for torches, as was done with some of the other eastern pines.

The natural range of Loblolly Pine lies in a belt about two hundred miles wide along the Atlantic Coast from Delaware to Florida, and from there along the Gulf of Mexico to Central Mississippi. It extends over the entire state of Alabama, all of Eastern Mississippi, and a part of Central and Western Tennessee. There are also large areas of it in Texas, Louisiana, Arkansas, and Oklahoma. Over vast areas west of the Mississippi this tree forms extensive pure stands, and there the trees attain a large size and develop a good form.

Locally, in the eastern and northern part of its range, pure stands are also found, especially where they have abandoned fields and other vacated places. Under favorable conditions, with plenty of overhead light, the Loblolly Pine develops a long straight trunk, free from branches for 50 to 75 feet from the ground, and reaches a diameter of from 15 to 24 inches, breast-high. Exceptional specimens sometimes reach a height of 120 feet, and a diameter of 3 feet. **** Its wood is coarser and less durable than that of the other pines with which it is commonly associated, yet there are many uses to which it is being put. ****

The Cuban Pine is the handsomest of all the southern pines. It occurs along the coast from South Carolina to the valley of the Pearl River in Louisiana, and is also found in Cuba, the Bahamas and the high-



(*Republished from American Forestry Magazine*)

THE RANGE OF THE SHORTLEAF PINE
The heavily shaded portion of the map shows the commercial range of this famous and much-used wood, while the lighter shaded portion indicates its botanical range.

lands of Central America. It is distinctly a coast tree and it is doubtful if the occurrence of this tree can be extended much beyond its natural range, which usually reaches from 30 to 100 miles inland. Where the ground is not too wet it is often associated with Longleaf Pine. The latter tree has longer, more flexible and more drooping needles and larger cones than the Cuban Pine. The wood of the Cuban Pine is very hard, heavy, strong, durable, and fully as hard as Longleaf Pine and used for about the same purposes. ****

The Pond Pine is a medium-size tree usually 40-50 feet high and rarely exceeding 2 feet in diameter.

It occurs in wet flats and peaty swamps along the coast from North Carolina to the banks of the St. John's River in Florida. In the northern part of its range it is associated with the Loblolly Pine and in the southern part it grows with the Cuban Pine. Among its chief distinguishing characteristics are its leaves, which are 6-8 inches long and occur in threes. Its oval, pointed cones are 2 to 4 inches long and persist for many years. The wood is occasionally sawed into lumber; the low grades are sold as Loblolly Pine and the best grades as Longleaf Pine. Locally, it is tapped for resin which flows rather freely and is fair in quality.

The Spruce Pine is a medium-size tree found on fresh, damp soils and occasionally in swamps from South Carolina to Florida and Eastern Louisiana. It usually occurs singly or in small groves, except in Northwestern Florida, where it occupies areas of considerable extent. It is easy to distinguish the Spruce Pine from all other southern pines by its short needles, small cones, and reddish-brown and deeply furrowed bark. The needles are in clusters of two and are less than 2 inches long. Sand Pine is the only other southern pine with needles regularly in clusters of two and usually less than 3 inches long. The wood resembles that of Loblolly Pine but has little commercial value.

The Sand Pine is a small tree found along the coast of Florida and Southern Alabama. It seldom extends inland for more than 30 miles and rarely exceeds 25 feet in height. It reaches its best development in Eastern Florida, but rarely is a specimen found which extends one foot in diameter. The trunks usually bear lateral branches down to the ground. Exceptionally good specimens are occasionally cut for small ship-masts. The tree is used chiefly as a soil binder on shifting sand areas so common in the region where it grows. ****

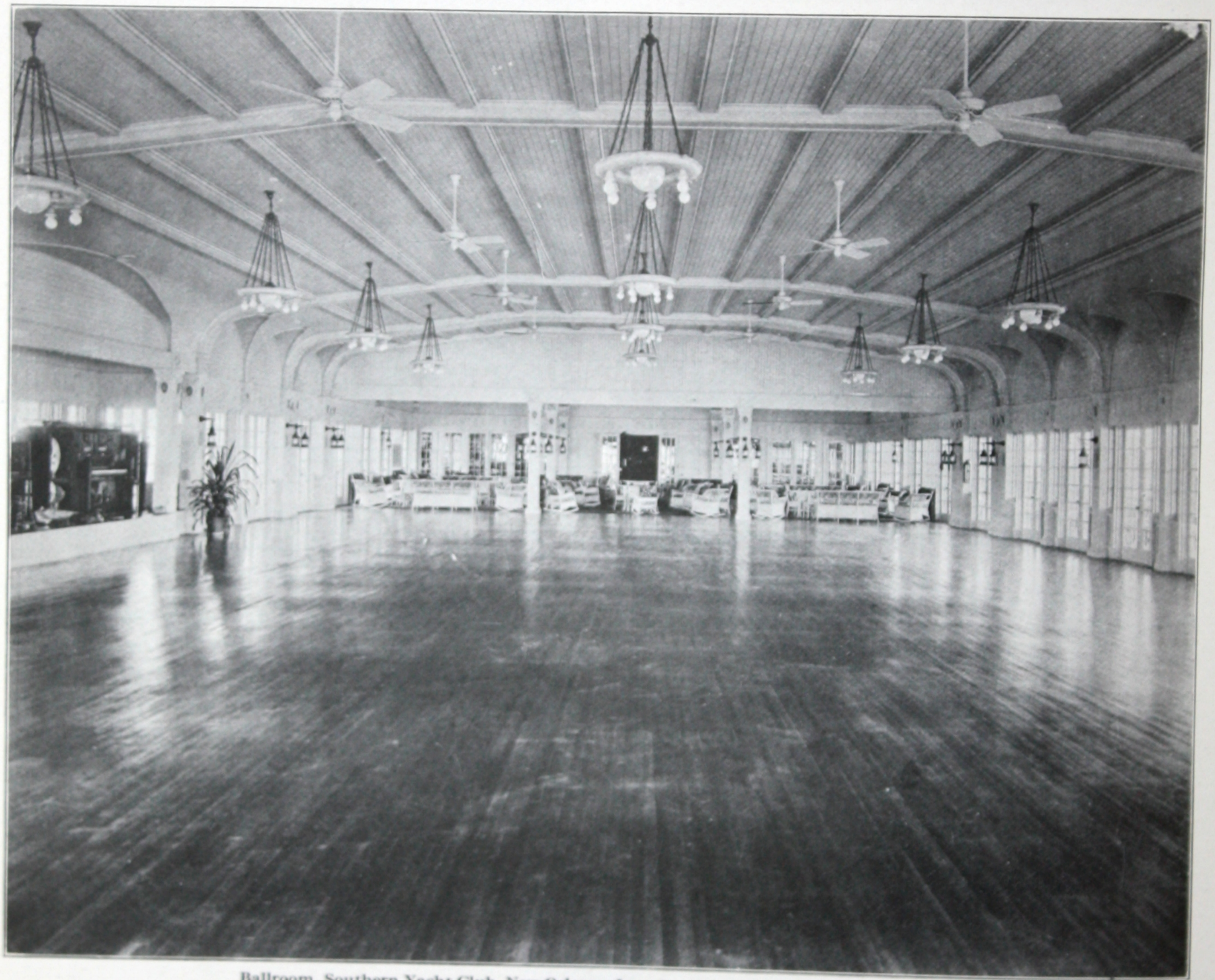
(Republished from American Forestry Magazine)

AN ARMORED KNIGHT OF THE FOREST
Part of the northern stand of Shortleaf Pine in America. Near Mont Alto, Franklin County, Pennsylvania.

The southern pines are known commercially in all parts of the world. Their wood and the naval stores derived from them have been big factors in the industrial development of many civilized countries. Enormous quantities of lumber have been harvested from these trees, and yet in spite of the heavy cutting which has been going on for many years they still produce more than one-third of the total lumber cut of the entire country.****

PART TWO

The Uses *of* Southern Pine



Ballroom, Southern Yacht Club, New Orleans, La. Southern Pine Edge Grain Flooring

SOUTHERN PINE occupies a place of first importance in every kind of heavy construction—for piling, trestles, trusses, beams, sleepers, joists, columns, rafters, sills—wherever great strength and endurance are essential. It has a multitude of uses in manufacture, the "important" factory uses enumerated in Kellogg's "Lumber and Its Uses" including more than 150 factory-made articles.

The manufacture of boxes and crates consumes 10% of the total annual lumber output of all woods in the United States, and Southern Pine provides the material for one-fourth of all such products.

In railway car construction the annual normal consumption of lumber is 1,260,000,000 board feet—and Southern Pine supplies 54% of it.

In the manufacture of agricultural implements—plows, harrows, cultivators, drills, planters, threshing machines, rakes, etc.—300,000,000 feet of lumber is used annually, and over 30% of it is Southern Pine.

In normal times 200,000,000 feet of lumber is required every year in ship and boat building, and 33% of that is Southern Pine.

Of wood paving materials and conduits 86% are Southern Pine.

In machine construction—steam shovels, hoists, cranes, well drills, dredges, crushers, presses—in which the wood used must possess strength, toughness and durability, Southern Pine supplies more than 33% of the wood used.

In the building of freight and passenger elevators, which consumes 10,000,000 feet of lumber each year, Southern Pine supplies 36%.

The foregoing—in which the figures quoted are from government statistics and absolutely correct—are only a few of the many ways in which Southern Pine proves its marvelous adaptability. In the government bulletin, "Uses of Commercial Woods of the United States," it is said of Southern Pine:

"In a large part of the country it is so universally used that there are few places of importance it does not fill."

THE ALL-PURPOSE WOOD—Besides its uses for heavy construction and manufacture, the service qualities of Southern Pine, combined with its low cost, availability and easy working nature, make it the ideal all-purpose wood for the farmer and amateur mechanic in the home. For farm building and repairs it is readily procurable everywhere in standard sizes and grades, and it is perfectly adapted to the construction of barns, silos, granaries, garages, cribs, icehouses, feed racks, troughs, poultry houses, sheds, plank walks, gates, fences, well tops and implement repairs—all the many building tasks, large and small, that the farmer finds need to turn his hand to.

Collecting resin from a "boxed" tree. From the raw resin is distilled turpentine and other chemical products.

It needs no introduction to the consuming public as a framing and construction material, and its merit as a wood for finer uses is well established. It is practically the only wood used extensively in framework, siding, flooring, sheathing, sashes, and doors, rails, spindles, newel posts and every variety of dressed or turned exterior and interior finish.

BY-PRODUCTS—Aside from its adaptability in construction and manufacture, Southern Pine surpasses all other woods in the variety and usefulness of the by-products recovered from it. Of all the excelsior produced necessitating the consumption of 100,000,000 board feet of lumber annually, 15% is Southern Pine. From the sap of the wood comes turpentine, resin, tar and pitch, their production a gigantic industry in itself. From the wood is distilled pine oil, a product that has a wide range of usefulness and promises to supersede linseed oil in the manufacture of paints. The toughest wrapping paper produced is manufactured from Southern Pine wood pulp. One of the chief products of the distillation of the wood is pyroligneous acid. From the pine needles, distilled green, an oil of balsamic odor is obtained, closely resembling the turpentine extracted from the wood of the tree. The pine needles, boiled in a strong solution of alkali, yield pine wool, which is woven into fabrics or used in upholstery. One of the materials used in the manufacture of lilac perfume is terpineol, made from Southern Pine turpentine, and that same turpentine is employed by manufacturers in making synthetic camphor.

Southern Pine for Interior Trim

Southern Pine makes an ideal interior finish wood because of its striking grain and beautiful texture, which make it particularly suited to use in fine joinery and high varnish finish.

Southern Pine does not "fuzz up" or show "knife marks" in the planing mill process, therefore it requires less labor and expensive hand scraping to secure smooth, satinlike surfaces.

It is bright and attractive in color, and its general beauty and utility are surpassed by no other wood, not even the most expensive hardwoods. A minimum of material and labor is required to obtain the finest effects, and it holds its finish better than most woods. It lends itself readily to any artistic treatment or design

Popular Finishes in Southern Pine Interior Trim

For specific directions as to how any of these finishes may be obtained, address Southern Pine Association

Popular Finishes in Southern Pine Interior Trim

For specific directions as to how any of these finishes may be obtained, address Southern Pine Association

and may be given any standard wood finish, taking stains, varnishes, hard oil and paint perfectly.

The Southern Pine designed for use in interior finish is lumber of uniformly high quality, and gives maximum service at exceptionally moderate cost. Enormous quantities, particularly of the shortleaf pine, are now used everywhere in America for the finest homes and public buildings, and this material has so firmly established itself as the equal of the best hardwoods for interiors that the question of quality no longer is a consideration. Southern Pine has a varied and beautiful grain and lends itself perfectly to natural finish, while an endless variety of effects are possible with the use of stains.

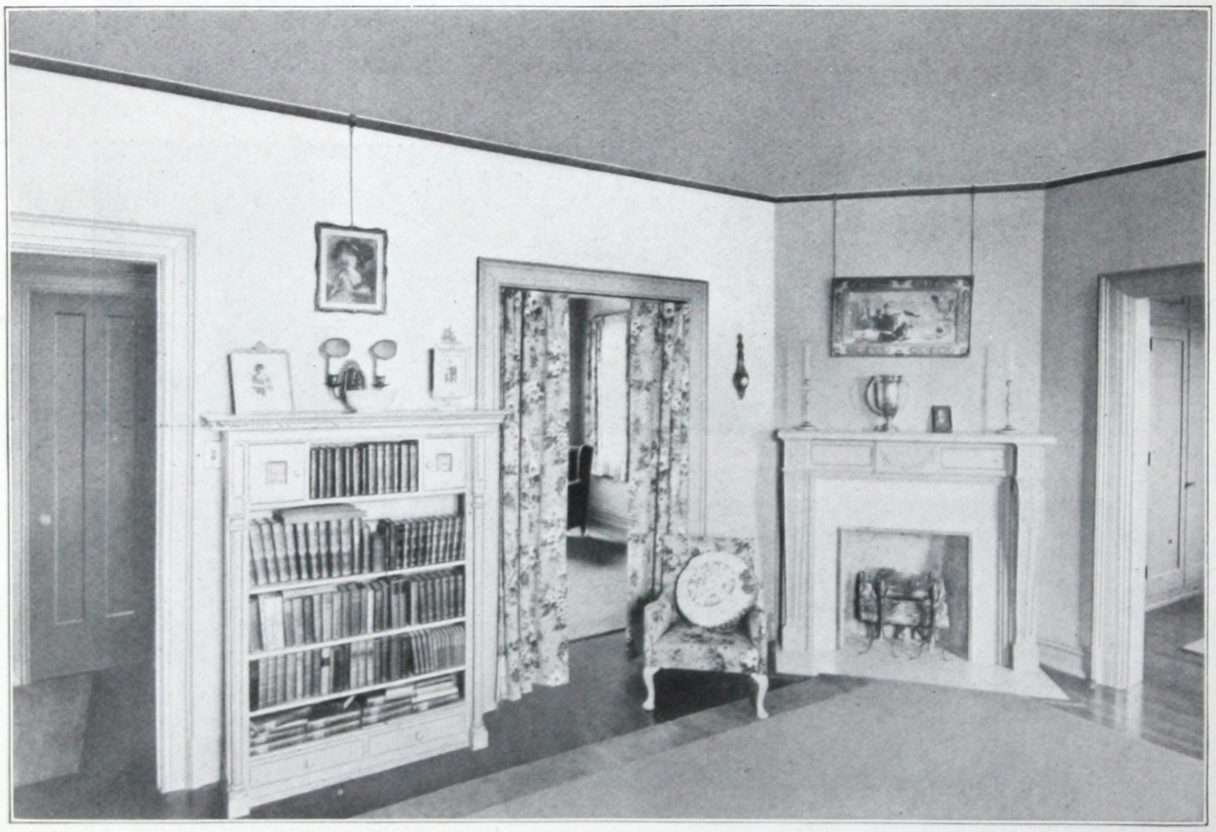
There is absolutely no color or tone effect in perfect, permanent interior finish that can not be obtained with the use of high grade Southern Pine, properly treated.

Directions for Finishing Southern Pine—The following recommendations regarding the finishing of Southern Pine are made by a prominent paint manufacturer:

"The first thing to consider in the finishing of Southern Pine used for interior trim, is the system of finishing employing stains and varnishes, because this type of finishing is used to a greater degree than any other. The first step in this method of finishing is the preparation of the wood. Before any stain is applied, the wood should be dry, clean and sanded to a smooth surface, the first coat consisting of stain is then applied.

"The selection of type and color of stain to be used on Southern Pine is a most important feature. Generally speaking, there are three types of stains on the market. One type of stain is particularly adapted to the finishing of one type of wood where the effect produced with this stain on another type of wood, would be most unsatisfactory. These stains are classified by type as follows: Spirit stains (commonly known as penetrating stains), oil stains and acid stains (sometimes called water stains). The first two types of stains, namely, spirit stains and oil stains, will produce very beautiful effects on Southern Pine. Oil stains are particularly designed for use on the so-called soft woods.

"On the other hand, it is most difficult to secure a satisfactory effect on Southern Pine with acid stains, on account of the fact that this type of stain having a large percentage of water present in its composition, tends to raise the grain of the wood and warp the wood just the same as water will do. However, this



The living room of a home in one of America's finest residential districts. In this room all of the trim (finished in old ivory enamel) and the floor are of Southern Pine.

same type of stain on mahoganies will produce the most beautiful effects which it is possible to secure on that type of wood.

"Many of the architects throughout the country who have used acid stains with highly satisfactory results on certain woods, will many times specify this type of stain for finishing Southern Pine. Sometimes the painting contractor will explain the impracticability of using acid stains in this case. Other times the painting contractor will follow the specifications with unsatisfactory results.

"After the stain has been applied to the interior trim, and same has been allowed to dry overnight, a thin coat of shellac may be applied. Where an oil stain is used, varnish may be applied directly over the stain, thinning the varnish in the proportion of one pint of turpentine to the gallon of varnish. Stains of the spirit type require a coat of shellac for sealing purposes, since spirit stains many times seriously affect the drying qualities of oil varnish where same is applied directly over the stain.

"The second coat, whether it be shellac or varnish, is lightly sanded when dry, and a third coat, consisting of interior finishing varnish, is applied. On cheaper types of work the finish is allowed to stand 'in the gloss,' but for better types of work another coat of varnish is applied. Sometimes a varnish is used which dries with a finish which closely approximates a dull rubbed effect. If a genuine rubbed effect is desired, the same type of varnish is used for the final coat as was used for the previous coat. This is permitted to harden thoroughly, and then is rubbed to a dull finish with powdered pumice stone and water, or oil.

A Pleasing Effect in Stairways.

"Frequently a waxed finish is used on Southern Pine. The procedure is just the same as that prescribed for the varnish finish up to the third coat, namely, a coat of stain and a coat of shellac is applied. The third coat consists of prepared wax applied with a soft cloth, and then rubbed briskly to a polish with a brush of the stiffness of a shoe brush. If desired, a second coat of prepared wax can be applied following the same procedure. By briskly rubbing the wax to a polished finish, the wax is incidentally hardened.

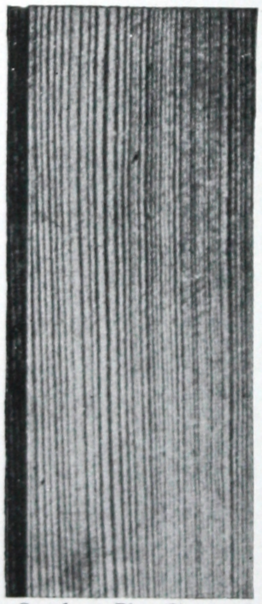
"The third method of finishing Southern Pine is one which is also quite popular, namely, the enamel finish. On Southern Pine the following procedure is recommended: First, be sure that the wood is perfectly dry, clean from all dirt and sanded smooth. The first coat should consist of a high grade enamel undercoater thinned with pure linseed oil in the proportion of one pint of oil to one gallon of undercoater. A second and third coat, consisting of enamel undercoater applied in the consistency supplied by the manufacturer should be applied, allowing sufficient time for drying between coats. The first and second coats should be sanded smooth with No. 0 sandpaper. The third or last undercoat should be sanded smooth with No. 0000 sandpaper. The fourth coat should be the first enamel coat of a high grade long-oil enamel. The first enamel coat should be thinned in the proportion of one pint of pure turpentine to one gallon of enamel. The fifth coat of enamel should be applied in the consistency supplied by the manufacturer, as soon as the fourth coat will permit. The painting contractor should be particularly careful to watch the condition of the first enamel coat because if too much time is permitted between coats, the fourth coat becomes hard and will have to be 'mossed' (the gloss will have to be rubbed down).

"There are certain places where Southern Pine is used for interior trim where an enamel finish is desired, but the cost of a five-coat finish with a very high grade enamel is not justified. For this type of finish we recommend applying a first coat, as above described, followed by a second coat consisting of thin white shellac, a third coat, consisting of enamel undercoater in the consistency supplied by the manufacturer, and a fourth coat consisting of a good grade of varnish enamel. For this type of finish, it will not be necessary to sand the undercoats before applying subsequent coats."

Southern Pine Flooring

Despite the fact that Southern Pine is a comparatively low priced wood, it is not in any sense a "makeshift" or "cheap" substitute for the hardwoods commonly used in the past for high class floors. The better grades of Southern Pine edge-grain (or quarter-sawed) flooring, as manufactured today, not only have all the good qualities of the higher priced hardwoods, but in some respects are distinctly superior to them. The lower cost of Southern Pine flooring, as compared to other woods suited to such use, is due to the fact that Southern Pine is very plentiful, not that it is in any way inferior.

Southern Pine flooring has an exceptionally handsome, even grain, a compact, velvety texture, and a pleasing natural color. If a darker color is desired, this material properly treated, takes and holds stains perfectly, so that it is possible to obtain any shade or tone suited to taste or requirements.



Southern Pine Quarter-Sawed (Edge Grain) Flooring.

Because of the close, compact grain of Southern Pine it makes a smoother floor, more easily finished, than do some hardwoods in common use. Furthermore, this close even grain presents a surface that resists wear as effectually as any hardwood and will withstand decay longer than any other wood used for flooring.

Southern Pine flooring, unlike much other flooring material, has comparatively few short lengths. This feature, combined with its superior workability, makes it exceptionally easy to work and lay.

Southern Pine flooring is as perfectly manufactured as any more expensive material and comes in standard sizes.

Care in Manufacturing and Handling—Southern Pine flooring is manufactured from carefully selected kiln-dried stock, is stored in dry sheds, shipped in closed cars, and handled with the utmost care to prevent the absorption of moisture. The user, in his turn, should give this material the same careful treatment until the floor is laid and ready for service. Practices to be avoided are:

Hauling and unloading flooring in damp weather. Storing in open sheds or newly plastered buildings. Permitting flooring to be laid before the building has thoroughly dried out after being plastered.

Southern Pine flooring may be had in two distinct forms, one known as edge-grain, the other as flat-grain. The edge-grained (also known as comb-grained, rift-sawed and quarter-sawed) is so cut that the edge of the grain is presented as a wearing surface, as in quarter-sawed oak. Flat-grained Southern Pine flooring, when cut from the same quality of logs, may be equally as hard as edge-grained, but is less durable. Flat-grained Southern Pine costs less than edge-grained, and is particularly suited for use in rooms that are carpeted or are not frequently subjected to moisture. Edge-grained Southern Pine floors have come to be recognized by the best authorities as the equal in every way of the more expensive hardwoods, and this material is now being specified by architects everywhere for use in many of the finest homes, as well as for apartment houses, ballrooms, assembly halls, offices and the most important public buildings. The government has used millions of feet of this flooring in departmental buildings and other structures where the service requirements were exceptional. In the United States Navy edge-grained Southern Pine flooring has proved superior to any other available material for battleship decking. For use in banks, hotels, railroad stations, schools, theatres, libraries, club houses, churches, courthouses, stores and factories, it occupies a position of importance. Because edge-grained Southern Pine floors can easily be given a beautiful finish, are not injured by wettings of periodical cleanings, and are possessed of such stubborn wearing qualities, they are esteemed perfect floors where unusually severe usage is given large areas.

Laying and Finishing Southern Pine Floors—Never lay a Southern Pine floor—nor any other highgrade floor, for that matter—until the plastering of the building is on and thoroughly dry.

Floors should be cleaned, smoothed, hand scraped and sandpapered with the grain of the wood, leaving them in a perfect condition for the painter. This work of preparation should be done carefully, but is not difficult, and any skilled carpenter should be able to accomplish it satisfactorily.

Realizing that more Southern Pine flooring is used than any other kind, the principal paint manufacturers are giving the finishes for Southern Pine special study.

Use no paste filler on Southern Pine floors—the close, compact grain of the wood makes the paste filler unnecessary and undesirable.

Be certain that each coat of finish given a floor is thoroughly dry before another is applied.

Avoid so-called "liquid" fillers—applied as a surface coat and permitted to remain there without rubbing off, as there is uncertainty as to their drying evenly throughout.

Natural Color Finish—Apply a very thin first coat of white shellac cut with pure grain alcohol. Sand

lightly with fine sandpaper, and apply two coats of best elastic floor varnish.

Use no dull varnish on floors. If a dull finish is desired, rub lightly with oil and pumicestone.

Wax varnished surface if desired.

STAINED SOUTHERN PINE FLOORS—In staining Southern Pine floors, the surface should be given, instead of shellac, a very thin coat of 75% turpentine and 25% linseed oil. When stain is applied directly to the wood, it is likely to be absorbed unevenly.

After the turpentine and linseed oil coat is dry and sandpapered, apply one coat of stain of the desired color in 40% linseed oil and 60% turpentine, evenly brushed into the wood. Follow this, when dry, with floor varnish as specified for natural color finish.

Do not attempt to finish a Southern Pine floor by the use of oil or wax alone. A polished surface will result, but it will be neither hard nor durable, and will soon discolor with dust and dirt.

WAXING VARNISHED SOUTHERN PINE FLOORS—To effectively and economically apply wax to a varnished floor a convenient method is to place a quantity of wax in a bag made of a double thickness of cheesecloth. The wax will work through the meshes of the bag, giving an even coating without waste. Go over the floor thoroughly.

After the floor has been waxed allow it to dry a half hour, then polish with a weighted floor brush (or a clean, soft cloth), first across the grain of the wood, then with it. If a brush is used, the finishing gloss should be given by means of a piece of carpet or felt placed under the brush.

After an hour's wait a second coat of wax should be applied in the same way, and rubbed to a polish.

CARE OF FINE FLOORS—It is an easy matter to keep a Southern Pine floor in perfect condition indefinitely, the requirement being only a little intelligent attention at the proper times. As in the case of other high grade floors, a Southern Pine wax finished floor should be newly waxed once a year, rubbing with a padded brush, preferably weighted. If unusually severe usage shows a tendency at any time to wear the finish down to the wood, an additional coat of wax should be applied to worn areas and thoroughly rubbed. After all, it is not the lumber in the floor which should stand the wear, but the finish on its surface; therefore this finish should be kept in good condition.

Waxed or varnished floors never should be cleaned with water. It is permissible to wipe the surface with a cloth dampened in tepid water, but all dampness should be taken up immediately with a dry cloth. Ordinarily, floors can be effectually cleaned by wiping with a dry cloth and the occasional use of a weighted floor brush, alone, or with a piece of carpet placed beneath it as a pad.

R. S. Kellogg, in his book, "Lumber and Its Uses," gives the following recipe as "one of the best for keeping a floor in good condition:"

"Equal parts of sweet oil, turpentine and vinegar, well mixed, and rubbed on the floor with waste or a cotton or woolen rag. The vinegar will cut the dirt or grime worked into the finish from shoes; the sweet oil produces a luster, and the turpentine promptly dries the moisture.

"The above mixture need not be applied oftener than once a month to insure a floor finish that will resemble the sheen of a piano."

A PERFECT FLOOR FOR LESS MONEY—It has been mentioned that Southern Pine floors cost less than floors of hardwoods, because Southern Pine is very plentiful and is so readily available everywhere east of the Rocky Mountains. While Southern Pine floors are in every respect the equal of floors made of other woods, there is a very substantial saving in the cost of material, as well as in the greater average lengths and superior workability of the Southern Pine flooring.

It is doubtful if there is a retail lumber yard in the United States east of the Rockies that does not carry Southern Pine flooring as a part of the regular stock. It can be and is shipped to dealers everywhere in mixed cars with other Southern Pine lumber, so there is no difficulty in obtaining it anywhere from northern New England to the Gulf of Mexico, or from New Jersey to Nebraska. As a matter of fact, some of the eastern states farthest from the southern sawmills are among the most extensive users of that wood for the making of fine floors in homes and public buildings. Architects are safe in specifying Southern Pine, with the assurance that the material will be manufactured with the most painstaking care and will give perfect service and satisfaction.

The system of lumber inspection inaugurated by the Southern Pine Association is the most perfect in the world, and purchasers of Southern Pine flooring may be assured of getting recognized standard grades by dealing with retailers who handle the product of Association mills.

STANDARD SIZES IN SOUTHERN PINE FLOORING—Southern Pine flooring may be had in either edge-grain or flat-sawed in any of the following standard sizes:

$\frac{13}{16}$ inch thick by $2\frac{3}{8}$ inch face.
$\frac{13}{16}$ inch thick by $3\frac{1}{4}$ inch face.
$\frac{13}{16}$ inch thick by $5\frac{1}{4}$ inch face.

This material may be had also in thickness of $1\frac{1}{16}$ inch and $1\frac{5}{16}$ inch, in the same widths and matching as the $\frac{13}{16}$ inch stock.

Southern Pine Flooring is graded as "A", "B", "C", "D", and "No. 1 Common" in edge-grain material; and as "A", "B", "C", "D", "No. 1 Common," "No. 2 Common" and "No. 3 Sheathing" (or "No. 3 Common Flooring") in flat-grain. (See also "Grading Rules.")

NAILS FOR LAYING SOUTHERN PINE FLOORING—All Southern Pine Floors should be "blind" nailed, and it is important that the proper kind of nails be used. The best nails for the purpose, especially for the material $\frac{13}{16}$ inch in thickness is the 8d steel-cut flooring nail. The nails should be driven not more than 10 inches apart, and in the finer floors they might well be even closer.

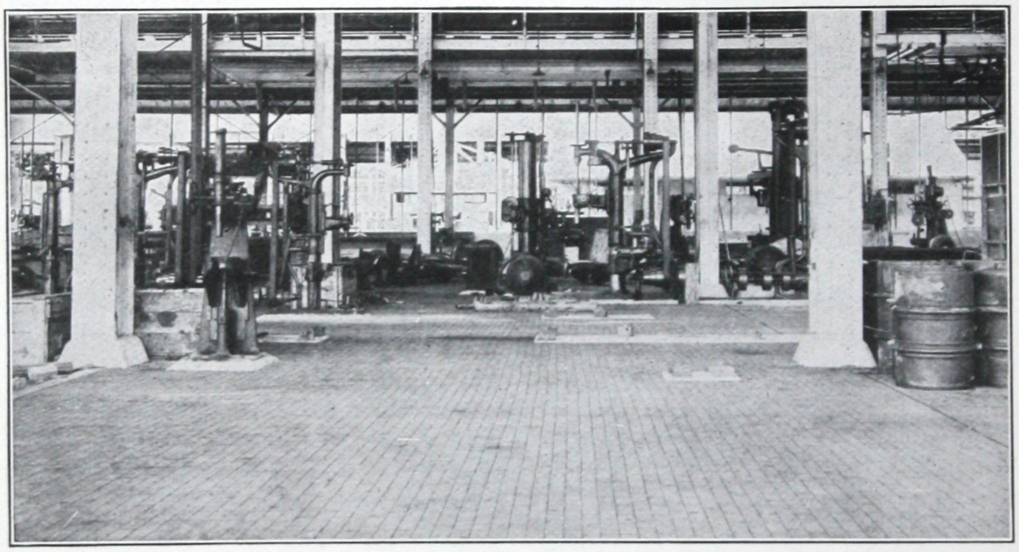
AMOUNT OF FLOORING REQUIRED—In figuring the amount of flooring required for a given space, figure the total number of square feet in the room to be floored by multiplying the length by the width. To this total add the following percentages:

26:32%	for............	$\frac{13}{16}$ inch by $2\frac{3}{8}$ inches
23:08	for............	$\frac{13}{16}$ inch by $3\frac{1}{4}$ inches
14:29	for............	$\frac{13}{16}$ inch by $5\frac{1}{4}$ inches

For specific directions as to how to lay and finish a Southern Pine floor, address Southern Pine Association.

Heavy Service Wood Block Floors and Paving

In the construction of commercial buildings and industrial plants, floors are a problem in themselves. The floor in such a structure is more than a part of the building. It is a part of the interior working equipment. The four walls and a roof provide protection and shelter for the activities they encompass, but a floor is something more than a surface sustaining industrial activities. The floor of a structure is subjected to service much more severe than any other part of the building. If it gives satisfactory service, it must have strength and durability; the demands made upon it require that it shall provide a safe surface upon which workers may move about; a smooth surface that shall not interfere with the activities of daily business; a resilient surface that shall minimize discomfort to standing workers and loss from breakage in falling tools or fragile factory products, and that shall be dry, sanitary and unaffected by the extremes of heat, cold or moisture. Safety to employees has come to be an important consideration with large employers everywhere, and a safe floor is one of the most important requirements, if accident is to be minimized in mills, factories, foundries and industrial plants generally.



Southern Pine Block Flooring, U. S. Government Machine Shops, Balboa, Canal Zone.

There is just one flooring material that fully meets all requirements in the factory, machine shop, the foundry, the mill and the warehouse—that is the floor of wood blocks.

The claim made for wood block floors, properly laid, is that they are the most durable, the most economical, the most sanitary, the smoothest and the safest of any floors known.

In factories, foundries, mills and machine shops, floors usually are called upon to sustain heavy machinery and other equipment, and to retain a smooth surface under stress of heavy trucking and other extreme abuse. The ordinary plank floors frequently

fail under such conditions because of their tendency to "shell," and otherwise disintegrate, at the same time presenting a surface dangerous in its possibilities of accident.

Wood blocks laid on a foundation of concrete usually cost slightly more in the first instance than other types of flooring. In the final accounting they are by far the least expensive. And wood blocks are clean, dry and impervious to heat or cold.

Service Floors and Viaducts, Bridges, Piers and Freight Yards—The best engineering practice throughout the country today provides for the use of wood blocks wherever extraordinary conditions demand exceptional durability in the wearing surface of trafficways. That this is true is amply proved by the adoption of wood block paving for docks, piers, bridges, freight yards, railroad station approaches, etc., wherever quality of service is given first consideration. The heaviest traveled trafficways of such character in America today are paved with wood blocks, solely because expert discrimination, unhampered by any misguided policy of false economy in first cost, has unerringly specified the best for the purpose.

Service Floors for Barns, Stables, and Outbuildings—Every experienced stockman and farmer appreciates the importance of clean, dry, sanitary floors in stables, barns, hog houses and other structures used to house domestic animals—such floors contributing materially to the well-being of live stock and minimizing troubles from disease.

Wood block floors in stables and barns, properly laid, are practically indestructible, and are dry, warm, elastic and cleanly. They are smooth without being slippery, and can be flushed with water readily. The first cost of Southern Pine wood block floors in some instances is slightly more than that of other materials, but in point of service—taking into consideration their durability, negligible maintenance cost, sanitary qualities and general acceptability—they are a conspicuous feature of economy in the equipment of barns, stables and other shelter houses for live stock in town or in the country.

PART THREE

General Specifications *for* Southern Pine Lumber *and* Timbers

A typical Southern Pine lumber mill.

THE term Southern Pine, includes the species of pine growing in the southern states from Virginia to Texas, that is, the pines hitherto known as longleaf pine (pinus palustris), shortleaf pine (pinus echinata), loblolly pine (pinus taedo), Cuban pine (pinus heterophylla), and pond pine (pinus serotina).

Under this heading two classes of timber are designated: (a) dense Southern Pine and (b) sound Southern Pine. It is understood that these two terms are descriptive of quality rather than of botanical species.

NOTE—Based on this density rule, a new classification for structural Southern Pine timbers has been established which eliminates the names "longleaf," "shortleaf," and "loblolly" pines. Dense Southern Pine includes, for structural purposes, the best pieces of what has hitherto been known as longleaf pine and excludes the occasional pieces of inferior quality. It also includes those pieces of shortleaf pine, Cuban pine and loblolly pines, which, because of their density and high percentage of summer wood, are equal in strength to longleaf pine, as shown from numerous tests by the United States Forest Service and many other well-known authorities.

(a) Dense Southern Pine shall show on one end or the other an average of at least six annual rings per inch and at least one-third summer wood, or else the greater number of the rings shall show at least one-third summer wood, all as measured over the third, fourth

Sawyers preparing to fell a tree; Steam Skidder in the distance.

and fifth inches of a radial line from the pith. Wide-ringed material excluded by this rule will be acceptable, provided that the amount of summer wood as above measured shall be at least one-half.

The contrast in color between summer wood and spring wood shall be sharp and the summer wood shall be dark in color, except in pieces having considerably above the minimum requirement for summer wood.

In cases where timbers do not contain the pith, and it is impossible to locate it with any degree of accuracy, the same inspection shall be made over 3 inches on an approximate radial line beginning at the edge nearest the pith in timbers over 3 inches in thickness and on the second inch (on the piece) nearest to the pith in timbers 3 inches or less in thickness.

In dimension material containing the pith but not a 5-inch radial line, which is less than 2 by 8 inches in section or less than 8 inches in width, that does not show over 16 square inches on the cross section, the inspection shall apply to the second inch from the pith. In larger material that does not show a 5-inch radial line the inspection shall apply to the 3 inches farthest from the pith.

The radial line chosen shall be representative. In case of disagreement between purchaser and seller the average summer wood and number of rings shall be the average of the two radial lines chosen.

(b) Sound Southern Pine shall include pieces of Southern Pine without any ring or summer wood requirement.

A Steam Skidder at work dragging logs to the logging railroad for shipment to the mill.

Loading logs for shipment to the mill.

General Timber Specifications

All timber except No. 1 Common must be free from defects such as injurious ring or round shakes, and through shakes that extend to the surface; unsound and loose knots, and knots in groups that will materially impair the strength. Seasoning checks and discolored sap shall not be considered defects in any grade.

KNOTS—Knots shall be classified as round and spike in form, and for quality as sound, incased, loose and unsound; knots are also classed as to size.

A round knot is oval or circular in form.

A spike knot is one sawed in a lengthwise direction.

A sound knot is one solid across its face, is as hard as the wood which surrounds it, may be either red or black, and fixed by growth or position so that it will retain its place in the piece.


A trainload of logs arriving at the mill.

An incased knot is one whose growth rings are not interwoven and homogenous with the growth rings of the piece it is in. The incasement may be partial or complete; if intergrown partially or so fixed by growth or position that it will retain its place in the piece, it shall be considered a sound knot; if completely intergrown on one face, it is a watertight knot.

A loose knot is one not held firmly in place by growth or position.

An unsound knot is one not as hard as the wood surrounding it, or one having a hole in it.

WANE—Wane is bark on the corner of the piece, or the absence of the corner.

SHAKES—Shakes are cracks appearing on the ends of timbers, either intersecting the annual growth rings or separating the same. They shall be classified as ring or round shakes and through shakes.

A ring or round shake is an opening between the annual rings.

A through shake is one extending from the region of the center of the surface of the piece or extending between two faces.

Shakes not hereinbefore described, unless known to have extensive penetration, shall not be considered a defect under this classification.


Logs in the log pond at the mill.

SIZES—All rough timber, except No. 1 Common, must be full size when green; ¼ inch shall be allowed for each side surfaced.

LENGTHS—Standard lengths are multiples of 2 feet, 8 to 20 feet, inclusive; extra lengths are multiples of 2 feet, 22 feet and longer. When lineal average is specified, standard of lengths shall be multiples of 1 foot.

Grades of Timbers

HEART TIMBERS—All timber specifications, except "Merchantable" and "Select Structural Timbers" specifying heart requirements, shall be considered as a special contract, and shall specify whether the heart requirements refer to surface or girth measurements in each piece.

NO. 1 COMMON TIMBERS—May be either dense or sound pine.

Unless otherwise specified, this grade will admit any amount of sapwood.

Common Timbers, rough, 4x4 and larger, may be ¼ inch scant in either or both of its dimensions, shall be well manufactured, and may have 1½ inch wane on one corner one-third the length of the piece, or its equivalent on two or more corners, the wane measured on its face.

Timbers 10x10 in size may have 2 inches wane as above; the larger sizes may have wane as above in proportion to sizes.

The diameter of any one knot shall not exceed 2 inches in 4x4 to 6x6; 2½ inches in 6x8 to 6x10; 3 inches in 10x10 to 10x12; 3½ inches in 12x12 to 12x14; 4 inches in 14x14 to 14x16; 4½ inches in 16x16 to 16x18. In sizes not mentioned the diameter of knots admissible will increase or decrease in proportion to the size of the timbers on same basis as above specified.

In determining the size of knots, mean or average diameter shall be taken, or the equivalent of the above in grouped knots at any one point. Shakes one-sixth the length of the piece, small unsound knots and a limited number of pinworm holes, well scattered, are admissible.

SQUARE EDGE AND SOUND TIMBERS—May be either dense or sound pine.

Unless otherwise specified this grade will admit any amount of sapwood.

Square Edge and Sound Timbers shall be well manufactured and shall be free from defects such as injurious ring or round shakes and through shakes that extend to the surface, unsound and loose knots and knots in groups that will materially impair the strength, and shall be free from wane. Seasoning checks and sap stain shall not be considered defects.

Interior view of a Southern Pine lumber mill.

MERCHANTABLE TIMBERS—May be either dense or sound pine.

All Merchantable Timbers shall be well manufactured and shall be free from defects such as injurious ring and round shakes and through shakes that extend to the surface, unsound and loose knots, and knots in groups that will materially impair the strength. Seasoning checks and sap stain shall not be considered defects.

Sizes under 9 inches on the largest dimension, shall show two-thirds or more heart surface on one of the wide faces; sizes 9 inches and over on the largest dimension shall show two-thirds or more heart on both the wide faces. When sticks are square the face showing the most heart shall govern the inspection on sizes under 9 inches, and the two faces showing the most heart shall govern the inspection when 9 inches and over. Heart showing the full length, even if not two-thirds of the area as above, shall meet the requirements of this quality.

Wane not exceeding one-eighth of the dimension of the face and one-quarter of the length of the piece of one corner, or the equivalent on two or more corners on not to exceed 10% of the pieces, shall be admitted.

SELECT STRUCTURAL SOUTHERN PINE—Requirements for Density and Rate of Growth:

Shall contain only sound wood and be well manufactured.

Shall conform to the definition of dense Southern Pine as adopted by the American Society for Testing Materials, August 21, 1915.

Unless otherwise specified, Select Structural Material shall show 85 per cent of heart, girth measurement, measured anywhere in the length of the piece. Any greater or less requirement as to heart shall be expressed in terms of per cent of girth measurement. Sap stain is not a defect in this grade.

For the purpose of determining whether any given piece meets the requirements for density and rate of growth, the following rule, suggested by the United States Forest Service, shall be applied. It will be sufficient if either end passes the inspection.

(1) Pith present or accurately located:

(A) Radial line of 5 inches present. (a) Apply inspection over third, fourth and fifth inches.

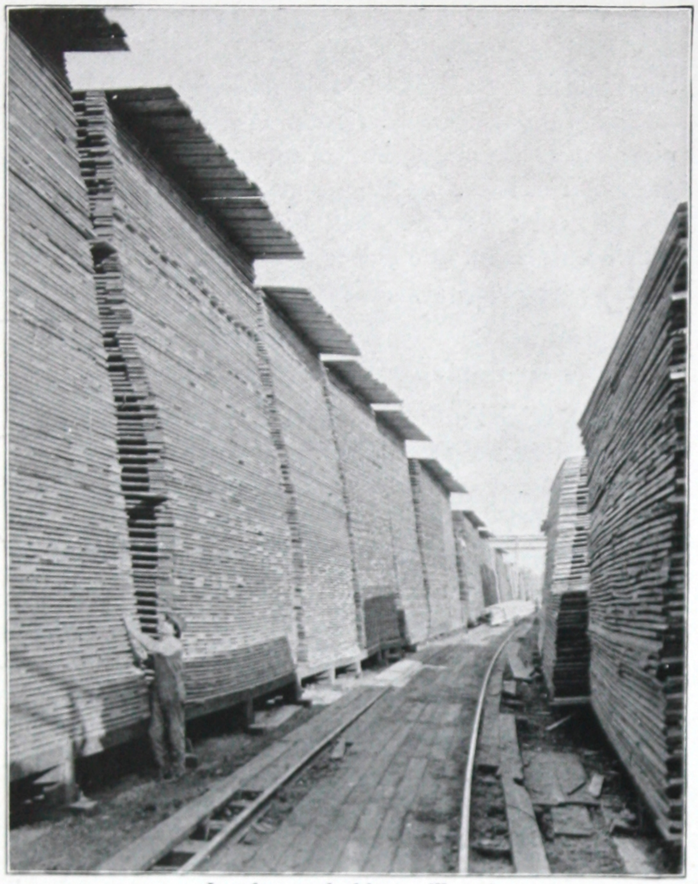
(B) Radial line of 5 inches not present. Apply inspection to the second inch on 2x3, 2x4, 2x6, 3x3, 3x4, 4x4, or any other dimension material that has less than 16 square inches on the cross section. (b) In the larger material apply inspection to the 3 inches farthest from the pith.

(2) Pith not present or cannot be accurately located:

(A) Material over 3 inches thick apply inspection to 3 inches nearest the pith.

(B) Dimension material 3 inches or less in thickness apply inspection to second inch of the piece nearest the pith.

Mechanical equipment conveys the lumber to various parts of the mill yard.


Lumber stacked in a mill yard.

(3) The radial line chosen shall show a representative number of annual rings of growth and percentage of summer wood.

Restrictions on Knots in Beams—Shall not have in Volume 1 sound knots greater in diameter than one-fourth the width of the face on which they appear—maximum knot 1½ inches. Shall not have in Volume 2 sound knots greater in diameter than one-half the width of the face on which they appear—maximum knot 3 inches.

The aggregate diameter of all knots within the center half of the length of any face shall not exceed the width of that face.

The diameter of a knot on the narrow or horizontal face of a beam is to be taken as its projection on a line perpendicular to the edge of the timber. On the wide or vertical face, the smallest dimension of a knot is to be taken as its diameter.

Restrictions on Knots in Columns—Shall not have sound knots greater in diameter than one-third the least width of the column—maximum knots 4 inches.

Restrictions on Shakes and Checks in Beams—Round or ring shakes shall not occupy, at either end of a timber, more than one-fourth the width of green material, nor more than one-third the width of seasoned material.

Any combination of checks and shakes which would reduce the strength to a greater extent than the allowable round shakes will not be permitted. Shakes shall not show on the faces of either green or seasoned timber.

Restrictions on Cross Grain in Beams—Shall not have diagonal grain with slope greater than one in twenty in Volume 1.

Grading Rules for Southern Pine Lumber

GENERAL INSTRUCTIONS

Southern Pine Lumber shall be graded and classified according to the following rules and specifications as to quality, and dressed stock shall conform to the subjoined table of standard sizes, except where otherwise expressly stipulated between buyer and seller.

Crooks—A crook is a deflection edgewise from a straight line in the length of a piece. The extent of a crook shall be determined by drawing a straight line from end to end of the piece on the concave edge, and measuring from such line to the edge of piece at the point of greatest deflection.

Knots—Knots shall be classified as follows:
Size—Pin, standard and large.
Form—Round, spike.

Quality—Sound, loose, incased, pith and unsound. A pin knot is sound and not over ½ inch in diameter.


Loading timbers for shipment to market.

These small timbers are what are known as deals, especially cut for the export trade.

A standard knot is sound and not over 1½ inches in diameter.

A large knot is one any size over 1½ inches in diameter.

A round knot is oval or circular in form.

A spike knot is one sawed in a lengthwise direction.

(The mean or average diameter of knots shall be considered in applying and construing the rules except in dimension.)

A sound knot is one solid across its face, is as hard as the wood it is in; may be either red or black, and is so fixed by growth or position that it will retain its place in the piece.

A loose knot is one not held firmly in place by growth or position.

A pith knot is a sound knot, with a pith hole not more than ¼ inch in diameter.

An incased knot is one whose growth rings are not intergrown and homogeneous with the growth rings of the piece it is in. The incasement may be partial or complete; if intergrown partially or so fixed by growth or position that it will retain its place in the piece, it shall be considered a sound knot; if completely intergrown on one face, it is a watertight knot.

An unsound knot is one not as hard as the wood it is in.

PITCH—Pitch pockets are openings between the grain of the wood containing more or less pitch or bark, and shall be classified as small, standard and large pitch pockets.

A small pitch pocket is one not over ⅛ inch wide.

A standard pitch pocket is one not over ⅜ inch wide, or 3 inches in length.

A large pitch pocket is one over ⅜ inch wide or over 3 inches in length.

A pitch pocket showing open on both sides of the piece, ⅛ inch or more in width, shall be considered the same as a knothole of equal size.

A pitch streak is a well-defined accumulation of pitch at one point in the piece, and when not sufficient to develop a well-defined streak, or where fiber between grains is not saturated with pitch, it shall not be considered a defect.

A small pitch streak shall be equivalent to not over one-twelfth the width and one-sixth of the length of the piece it is in.

A standard pitch streak shall be equivalent to not over one-sixth the width and one-third of the length of the piece it is in.

WANE—Wane is bark, or the lack of bark, or a decrease of wood from any cause, on the edge of the piece.

SAP—Bright sap shall not be considered a defect in any of the grades provided for and described in these rules. The restriction or exclusion of bright sap constitutes a special class of material which can only be secured by special contract.

Sap stain, such as usually occurs in the drying process, or which occurs, as a result of shipping lumber while green, when so ordered, shall not be considered a defect in any of the grades of common lumber.

CLOSE GRAIN—The term "close grain" shall mean an average of not less than six annular rings to the inch.

DEFECTIVE GRAIN—Chipped grain consists in a part of the surface being chipped or broken out in small particles below the line of the cut, and, as usually found, should not be classed as torn grain and shall not be considered a defect.

Torn grain consists in a part of the wood being torn out in dressing, and is of four distinct characters—slight, medium, heavy and deep.

Slight torn grain should not exceed 1-32 inch in depth, medium torn grain 1/16 inch, and heavy torn grain ⅛ inch. Any torn grain heavier than ⅛ inch shall be termed deep.

Loosened grain consists in a point of one grain being torn loose from the next grain.

Note—The booklet "Standard Specifications for Grades of Southern Yellow Pine Timber," issued by the Southern Pine Association, contains in detail the specifications for Southern Pine timber generally recognized by the lumber trade for many years.

A similar book, also published by the Association, is entitled, "Standard Specifications for Grades of Southern Yellow Pine Lumber".

PART FOUR

Physical Properties *of* Southern Pine

THE laws which govern the strength of structural timbers can be stated as follows: First, the clear wood of the species showing the greater density usually possesses the greater strength; second, the strength of the structural size timber is determined by the strength of the clear wood of that species and by the influence of defects, knots, checks, shakes, irregular grain and rot; third, the stiffness or elastic strength of the timber beam is more dependent upon the quality of the wood fiber or clear wood structure than upon the number and character of defects which the member contains; fourth, the ultimate strength of the timber beam is dependent upon the influence of defects as well as the strength of the wood fibre; fifth, the main defects which can be counted upon seriously to weaken a sound timber beam are large knots or irregular grain in the lower mid-section of the piece.

TABLE I

Results of tests on four species of Southern Yellow Pine tested in a green condition in the form of small clear pieces

Common and botanical name	1	Pine, long leaf (pinus palustris)	Pine, shortleaf (pinus echinata)	Pine, loblolly (pinus taeda)	Pine, Cuban (pinus heterophylla)
Locality where grown	2	Florida, Louisiana, Mississippi	Arkansas, Louisiana	Florida, North Carolina, South Carolina	Florida
Number of trees	3	34	12	15	5
Number of rings per inch	4	18	12	8	17
Summer wood (per cent.)	5	39	40	42	44
Moisture content (per cent.)	6	47	64	70	47
Specific gravity oven-dry, based on:					
Volume when green	7	.55	.50	.50	.58
Volume when oven-dry	8	.64	.58	.59	.68
Weight per cu. ft. (green), lbs	9	50	50	54	53
Shrinkage from green to oven-dry condition:					
In volume, per cent. of dimensions when green	10	12.3	12.6	12.6	12.7
Radial, per cent. of dimensions when green	11	5.3	5.1	5.5	5.9
Tangential, per cent. of dimensions when green	12	7.5	8.2	7.5	7.5
Static bending:					
Fiber stress at elastic limit, lbs. per sq. in	13	5400	4500	4400	5600
Modulus of rupture, lbs. per sq. in.	14	8700	8000	7500	8800
Modulus of elasticity, 1000 lbs. per sq. in	15	1630	1450	1380	1630
Work in bending:					
To elastic limit, in lbs. per cu. in.	16	1.00	.79	.81	1.10
To maximum load, in lbs. per cu. in	17	8.0	8.7	8.0	7.9
Impact bending:					
Fiber stress at elastic limit, lbs. per sq. in	18	10800	11200	9500	11300
Work in bending to elastic limit, in lbs. per cu. in	19	3.5	4.0	3.1	3.9
Height of drop causing complete failure, 50-lb. hammer, in	20	34	39	32	37
Compression parallel to grain:					
Fiber stress at elastic limit, lbs. per sq. in	21	3840	3650	2870	3950
Maximum crushing strength, lbs. per sq. in	22	4390	3810	3580	4470
Compression perpendicular to grain—fiber stress at elastic limit, lbs. per sq. in	23	600	480	550	590
Shearing strength parallel to grain, lbs. per sq. in	24	1070	890	900	1030
Tension perpendicular to grain, lbs. per sq. in	25	290	330	280	290
Hardness, load required to embed a 0.444-in. ball to one-half its diameter:					
End, lbs	26	550	490	400	570
Side, lbs	27	590	560	450	630

In addition to the strength properties of wood, the producer and consumer must concern themselves with its durability. Wood in contact with the ground or subject to damp and wet atmospheres must be capable of resisting decay and under the most unfavorable conditions must be suspectible of receiving a maximum amount of preservative. Before incorporation in a structure lumber or timber must be preserved from destructive mechanical agencies as well as decay. Injury resulting from handling in shipment may produce damage to a greater or less extent. Sap stains in lumber can be prevented by the use of toxic solutions at the time of manufacture. Checking in yard stocks can be prevented by application of air-retardant solutions at the ends of the timber or boards and by controlling the humidity and moisture conditions during the process of drying. Warping can be reduced to a minimum by proper piling with free circulation of air and protection from extreme ranges of temperature and weather conditions. Decay either in the form of dry or damp rot in lumber stocks in most cases can be eliminated and is usually due to piling in proximity to or in contact with infected timber. In determining the value of timber in its susceptibility to preservative treatment, usually the lower grades with the highest percent of sap wood and the least density or weight per cubic foot are preferable, thus making available cheaper grades for economical construction.

The properties of Southern Yellow Pine which make this wood valuable for so many structural and industrial uses are illustrated in Tables 1 and 2 of Forest Service Bulletin 556. Additional data is also furnished in that publication as a basis on which to establish new industrial applications of this wood as a substitute for standard species heretofore used which are not now available in sufficiently large quantities or the application of which is rapidly becoming uneconomical because of depletion. Lumber and timber must be selected scientifically to produce the most economical structure and the wood must be adapted to the particular use for which it is best fitted. Practice and long usage in

many cases have decided the applicability of certain woods for certain uses, but the modern manufacturer must resort to a careful scientific analysis of the physical properties of the material in order to find the proper species for his use or a desirable substitute for exhausted species.

All structures involve the use of members which require radically different properties. The mechanical properties of the wood determine the fitness and ability of any species to resist the applied forces and determine its use for any special purpose. Girders, stringers or beams must develop a high modulus of rupture and fibre stress at elastic limit when subjected to transverse bending and in addition must be strong in horizontal shear resistance. Posts or columns must develop high strength in compression parallel to the grain, stiffness, resistance to impact and a reasonable degree of hardness. Sills and bearing members such as railroad ties must withstand crushing action or compression perpendicular to the grain. For the latter purpose, the fibrous structure of the wood must be compact enough to furnish high frictional resistance and holding power on spikes. For the selection of flooring material, in addition to the necessary strength properties, hardness and resistance to abrasion are the

TABLE 2

Results of tests on four species of Southern Yellow Pine tested in an air-dry condition in the form of small clear pieces

Common and botanical name	1	Pine, long leaf (pinus palustris)	Pine, short leaf (pinus echinata)	Pine, loblolly (pinus taeda)	Pine, Cuban (pinus hetero-phylla)
Locality where grown	2	Florida, Louisiana, Mississippi	Arkansas, Louisiana	Florida	Florida
Number of rings per inch	3	18	10	9	17
Summer wood, per cent	4	38	40	42	44
Moisture content, per cent	5	9.2	11.0	6.5	8.8
Specific gravity, oven-dry, based on volume when air dry	6	.66	.54	.57	.66
Weight, per cu. ft. (air dry), lbs.	7	42	38	38	45
Static bending:					
Fiber stress at elastic limit, lbs. per sq. in.	8	11800	9200	11700	12400
Modulus of rupture, lbs. per sq. in.	9	16700	13900	15600	18300
Modulus of elasticity, 1000 lbs. per sq. in.	10	2200	1970	2130	2220
Work in bending:					
To elastic limit, in lbs. per cu. in.	11	3.58	2.46	3.70	3.88
To maximum load, in lbs. per cu. in.	12	11.3	10.1	9.0	13.1
Impact bending:					
Fiber stress at elastic limit, lbs. per sq. in.	13	16400	16600	14800	18000
Work to elastic limit, in lbs. per cu. in.	14	6.6	6.5	5.9	7.2
Height of drop causing complete failure, 50-lb. hammer, in.	15	32	36	26	42
Compression parallel to grain:					
Fiber stress at elastic limit, lbs. per sq. in.	16	9250	7080	7980	9160
Maximum crushing strength, lbs. per sq. in.	17	10880	8660	11300	11890
Compression perpendicular to grain—fiber stress at elastic limit, lbs. per sq. in.	18	1670	1310	1600	1620
Shearing strength parallel to the grain, lbs. per sq. in.	19	1640	1390	1720	1920
Tension perpendicular to grain, lbs. per sq. in.	20	420	410	370	650
Hardness, load required to embed a 0.444-in. ball to one-half its diameter:					
End, lbs.	21	1140	940	1030	1200
Side, lbs.	22	1020	880	840	1160

TABLE 3

Approximate figures for change of properties with change of moisture content; variation of properties with specific gravity; reliability of averages, and probable deviations from averages of individual trees and specimens

For use with Tables 1 and 2

Property	Average increase (or decrease) in value effected by raising (or lowering) the moisture content 1% when at about 12%	Approximate power of specific gravity according to which property varies	Probable variation of present average (when from 5 trees) from true species average	Probable variation of random tree from average for species
1	2	3	4	5
	Per cent.	Per cent.	Per cent.	Per cent.
Specific gravity based on volume when green	...	...	1.7	3.8
Shrinkage	...	1	...	...
Static bending:				
Fiber stress at elastic limit	6	1	5	12
Modulus of rupture	4	1	4	9
Modulus of elasticity	2	1	5	11
Work to elastic limit	8	2	7	16
Work to maximum load	*—1	2	6	14
Impact bending:				
Fiber stress at elastic limit	4	1	4	8
Work to elastic limit	5	2	5	12
Height of drop	*—3	2	7	15
Compression parallel to grain:				
Fiber stress at elastic limit	5	1	5	12
Crushing strength	4	1	4	9
Compression perpendicular to grain—fiber stress at elastic limit	6	2	6	14
Hardness, end	3	2	4	9
Hardness, side	1	2	5	10
Shearing strength parallel to grain	4	1	3	7
Tension perpendicular to grain	1	2	5	12

*The minus sign indicates decrease.

IMPORTANT NOTE: "Safe working stresses for the design of working structural timbers should be based on the data in table 1 rather than in table 2." "It will be noted from tables 1 and 2 that in most properties the dry material excels the green. In structural design, however, no allowance should be made for such increase in strength, because in large timbers it is a very indefinite quantity. The increased strength of the wood fibers is usually offset by checks and other defects resulting from drying. Moreover, many structural timbers are subject to moisture changes and the outer fibers may at any time become wet enough to reduce the mechanical properties to the level of those of green timber. For these reasons the strength of green material should be made the basis of stress to be used in structural design."

ruling factors. Toughness, stiffness and resilience are the properties which determine the adaptability of the wood to sudden application and reversal of stress such as are incurred in wagon poles and other implement parts.

SOUTHERN PINE

Southern Yellow Pine is a moderately heavy wood, possesses great stiffness as a beam or post, has the highest shock resisting ability combined with hardness of the conifers and is subject to a very moderate shrinkage. Properly selected for its proposed use, it will last longer in exposed situations and is more durable than most timbers. In addition to its strength and durability, Southern Yellow Pine is more subject to preservative treatment than the nearest similar species of wood and will take up twice as much creosote under the same conditions of treatment in drying, temperature and pressure. Its resinous content combined with maximum heartwood requirements are inherent deterrents against rot. Whereas the fibrous wood structure possesses strength to resist loads, its cellular nature provides the resistance to conduction of heat or cold, as well as lightness in weight. The heat conductivity of Southern Yellow Pine is less than one-third that of brick or concrete and less than one-three hundredth part that of steel. Unprotected heavy timber mill-construction will resist the action of high temperature fires for a period of duration two to four times that of unprotected steel and the unburned timber shows no loss in strength from the effects of fire.

The working stresses given in Table 4 are recommended for the different species of Southern Yellow Pine

TABLE 4

Recommended working stresses, Southern Pine Association.

POUNDS PER SQUARE INCH

DESIGN FACTORS	Class A	Class B	Class C	Class A	Class B	Class C
	SELECT STRUCTURAL GRADE SOUTHERN YELLOW PINE					
	Dense					
Extreme fiber stress	1300	1800	2000			
Direct tension	1300	1800	2000			
Compression (short columns)	1100	1300	1500			
Compression (long columns)	1100—20 l/d	1300—20 l/d	1500—20 l/d			
Compression ⊥ Grain	250	300	400			
Longitudinal shear in beams (uniform loads)	175	175	175			
Longitudinal shear for concentrations within 2 beam depths of end support	225	225	225			
Shear ∥ grain in details	175	175	175			
Modulus of elasticity	1800000	1800000	1800000			
Modulus of elasticity deflection of beams in completed structures	1600000	1600000	1600000			
Weight per cubic foot, lbs	48	48	48			
	LONG LEAF SOUTHERN YELLOW PINE (MERCHANTABLE)					
	Dense			Coarse		
Extreme fibre stress	1200	1600	1800	1100	1400	1600
Direct tension	1200	1600	1800	1100	1400	1600
Compression (short columns)	1000	1200	1400	900	1100	1300
Compression (long columns)	1000—20 l/d	1200—20 l/d	1400—20 l/d	900—20 l/d	1100—20 l/d	1300—20 l/d
Compression ⊥ grain	225	250	350	200	225	300
Longitudinal shear in beams (uniform loads)	175	175	175	150	150	150
Longitudinal shear for concentrations within 2 beam depths of end support	225	225	225	200	200	200
Shear ∥ grain in details	175	175	175	150	150	150
Modulus of elasticity	1800000	1800000	1800000	1600000	1600000	1600000
Modulus of elasticity deflection of beams in completed structures	1600000	1600000	1600000	1400000	1400000	1400000
Weight per cubic foot, lbs	48	48	48	45	45	45
	SHORT LEAF SOUTHERN YELLOW PINE (SQUARE EDGE AND SOUND)					
	Dense			Coarse		
Extreme fiber stress	1100	1400	1600	900	1100	1300
Direct tension	1100	1400	1600	900	1100	1300
Compression (short columns)	900	1100	1300	800	900	1000
Compression (long columns)	900—20 l/d	1100—20 l/d	1300—20 l/d	800—20 l/d	900—20 l/d	1000—20 l/d
Compression ⊥ grain	200	225	300	175	200	250
Longitudinal shear in beams (uniform loads)	150	150	150	125	125	125
Longitudinal shear for concentrations within 2 beam depths of end support	200	200	200	175	175	175
Shear ∥ grain in details	150	150	150	125	125	125
Modulus of elasticity	1600000	1600000	1600000	1400000	1400000	1400000
Modulus of elasticity deflection of beams in completed structures	1400000	1400000	1400000	1200000	1200000	1200000
Weight per cubic foot, lbs	40	40	40	36	36	36

Class A—Exterior structures exposed to saturated moisture conditions such as wharves, piling and sills.
Class B—Exterior structures exposed to the weather but not in contact with the soil, such as bridges and open sheds.
Class C—Interior dry structures, such as enclosed buildings and roof trusses.

SOUTHERN PINE

TABLE 5

Results of tests of structural size green Southern Yellow Pine timbers.
Project 184. U. S. Forest Service, 1914.

	No. of Specimens	Inches Size	R. P. I.	% S. W.	% Moisture	Sp. Gr. Dry	Modulus of Rupture. Lbs. Sq. In.	Modulus of Rupture. % Minor	F. S. Elastic Limit. Lbs. Sq. In.	F. S. Elastic Limit. % Minor	Modulus of Elasticity Lbs. Sq. In.	Modulus of Elasticity % Minor	Calcu. Hor. Shear Lbs. Sq. In.	Max. Comp. ‖ Grain Lbs. Sq. In.	Comp. ⊥ Grain F. S. At. El. Lim. Lbs. Sq. In.	Hardness End Lbs. Sq. In.	Hardness Side Lbs. Sq. In.	Shear Rad. Lbs. Sq. In.	Shear Tan. Lbs. Sq. In.	Cleavage Rad. Lbs. Sq. In.	Cleavage Tan. Lbs. Sq. In.	Tension Rad. Lbs. Sq. In.	Tension Tan. Lbs. Sq. In.	Shrinkage Rad. Percent	Shrinkage Tan. Percent	Shrinkage Vol. Percent	Resin Content Percent	REMARKS
Average..	6	6x12	14	35	32.2	.58	8252	88	4747	80	1942500	116	424	4745	750	564	626	1146	1081	174	187	273	331	6.1	8.1	13.0	5.51	Defects—Small knots and shakes; one horizontal shear failure; one brash tension; remainder compression.
Maximum.	....	....	20	39	33.6	.608	9360	97	5980	92	2414000	134	486	5090	948	649	708	1272	1290	228	210	320	385	7.8	9.5	15.4	9.11	
Minimum..	....	....	8	29	30.0	.512	6680	77	3630	72	1541000	109	339	4180	546	472	476	1028	905	144	176	205	268	3.7	7.0	11.3	2.19	
Average...	4	6x12	20	34	33.2	.58	6938	85	4313	86	1656000	114	347	4185	503	514	575	1136	1068	181	186	260	268	5.6	7.4	10.8	8.32	Defects—Small knots and shakes; one diagonal tension failure; remainder compression.
Maximum.	....	....	26	40	36.5	.635	7440	109	5110	95	2210000	138	372	4720	567	562	629	1262	1174	210	202	299	386	6.2	9.0	14.0	18.04	
Minimum..	....	....	17	29	29.4	.537	6430	70	3800	74	1270000	105	318	3770	425	413	488	992	858	158	156	176	197	5.0	6.3	8.8	3.78	
Average...	5	8x16	13	38	30.9	.57	6178	68	4274	73	1657000	92	412	4762	629	547	633	1074	1069	169	180	268	317	5.4	7.8	13.1	8.04	Defects—Star, cup and radial shakes; all horizontal shear failures; minimum value cull under Association rules.
Maximum.	....	....	16	42	32.7	.671	7550	80	4870	80	2027000	106	503	4970	862	661	740	1153	1130	200	240	419	374	6.7	8.9	14.6	25.28	
Minimum..	....	....	11	33	28.9	.516	5360	58	3290	59	1450000	89	360	4460	532	466	563	1014	1042	152	158	168	230	4.7	6.8	11.7	1.21	
Average...	4	8x16	11	38	33.9	.55	6325	77	4320	83	1765000	105	422	4340	517	468	557	1082	1032	169	170	226	285	5.6	8.2	13.1	8.93	Defects—Radial shakes and slight spiral grain; one compression failure; remainder horizontal shear.
Maximum.	....	....	13	46	35.5	.580	6850	80	4560	90	1866000	112	455	4490	572	479	584	1110	1111	186	191	307	382	5.8	8.6	13.3	16.40	
Minimum..	....	....	9	33	30.1	.511	5540	68	4120	75	1655000	92	376	4210	459	454	533	1051	986	157	138	164	189	5.1	7.8	12.9	2.50	
Average...	2	6x12	13	42	31.9	.61	7810	78	5385	84	2130000	108	402	4970	567	535	628	1160	1118	174	182	226	297	5.9	9.4	14.8	13.02	Defects—Heavy shakes; horizontal shear failures.
Maximum.	....	....	16	45	32.7	.664	7910	83	5440	90	2249000	114	403	5270	586	599	706	1231	1121	182	192	244	308	6.2	9.8	15.5	23.72	
Minimum..	....	....	9	38	31.0	.560	7710	72	5330	78	2011000	103	400	4670	548	472	551	1088	1116	166	172	208	286	5.6	9.0	14.1	2.32	
Average...	3	6x12	12	27	30.5	.527	5756	72	4173	84	1448000	104	288	4200	478	517	580	996	945	188	193	184	296	4.4	7.2	9.9	8.66	Defects—Large and small knots; all tension failures.
Maximum.	....	....	14	31	32.0	.559	6000	80	4410	104	1501000	116	302	4590	517	562	629	1023	1050	210	221	288	333	5.8	8.4	10.5	18.04	
Minimum..	....	....	11	23	29.2	.498	5630	65	3920	71	1353000	91	281	3640	450	446	516	973	858	176	172	226	240	3.6	6.5	9.0	2.43	
Average...	5	8x16	14	33	31.6	.52	5192	64	3356	65	1406000	94	347	4200	557	475	548	1005	977	167	161	305	341	5.1	7.4	12.1	7.33	Defects—Shakes, knots and spiral grain; three tension failures; two horizontal shear failures.
Maximum.	....	....	17	39	33.2	.554	5990	77	4200	84	1651000	100	404	4810	620	562	621	1096	1058	194	185	349	394	6.0	8.3	13.2	13.86	
Minimum..	....	....	10	26	30.5	.472	4270	56	2400	43	1225000	90	281	3650	495	381	448	915	903	138	120	268	287	4.0	5.4	11.5	1.91	
Average...	5	8x16	13	34	32.5	.54	6048	76	3676	73	1517000	101	402	4182	519	467	534	1052	1001	164	163	260	269	5.0	7.4	11.4	7.71	Defects—Knots, shakes, spiral and irregular grain; horizontal shear failures combined with compression and tension.
Maximum.	....	....	16	40	37.2	.592	6980	82	4530	85	1819000	103	465	4430	648	511	584	1098	1094	199	176	300	324	5.8	8.3	13.1	13.56	
Minimum..	....	....	9	25	27.4	.510	5500	71	2800	51	1383000	100	368	3740	458	412	492	972	861	152	138	164	189	4.4	6.7	10.1	3.49	

classified in accordance with the "density rule" into "Dense" and "Coarse" grades. The working stresses in transverse bending are based on a factor of safety of two on the Elastic Limit, which is the customary practice in the case of other structural materials. Although working stresses must be kept within the limits of proportionality of stress and deformation, the conditions of loading control the safe values to be employed. Southern Yellow Pine will develop higher resistance to moving or impact loads than to static loads and will recover without injury from momentarily applied loads beyond the Static Elastic Limit. In all timber construction, warning of incipient failure occurs long before actual failure. When the design stress includes allowances for impact loads, the recommended working stresses can very properly be increased in proportion to the provision for impact stresses. In light joisted structures with interior plastered partitions and ceilings, the depth of floor beams should be determined by safe limits of deflection. This type of construction occurs in residence buildings for which building code requirements exceed the actual live loads which ordinarily obtain.